A Structured Review of Methodologies for Measuring Socio-Economic Impacts of Unequal Urban Opportunity for Women

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Abstract. Women's fear in urban space is increasingly recognized not only as a safety issue, but as a socio-economic constraint affecting mobility, access to opportunities, and participation in urban life. However, the literature remains fragmented in the way it translates women's perceived insecurity into measurable impacts relevant for urban planning. This paper presents a structured review of the methodological approaches used to operationalize the socio-economic impacts of women's fear in cities as part of a broader systematic literature review. Rather than focusing exclusively on safety perception, the review investigates how studies measure the downstream effects of fear through indicators and proxies related to restricted mobility, reduced access to jobs and services, time and travel burdens, additional financial costs, lower use of public space, and unequal urban participation. The paper maps the main methodological families emerging from the literature, including perception-based surveys, participatory and audit-based approaches, GIS and built-environment assessments, spatial-statistical models, and transport accessibility frameworks. The review argues that existing studies are stronger in identifying correlates of perceived insecurity than in constructing robust and transferable indicator systems able to capture its socio-economic implications. The paper outlines the basis for a gender-sensitive and spatially explicit framework to measure how fear reshapes access, mobility, and urban opportunity.

Keyword: women's fear in the city · socio-economic impact · gender-sensitive planning

1 Introduction

Urban space is not experienced equally by all its users. A growing body of research shows that women's everyday interactions with streets, public transport, parks, public facilities, and other urban environments are shaped by gendered perceptions of risk, embodied vulnerability, and unequal conditions of access and exposure [1, 2]. For this reason, women's fear in the city should not be interpreted merely as an individual or psychological response to unsafe surroundings [3–5]. Rather, it should be understood as a structural expression of urban inequality, one that affects how space is perceived,

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navigated, and used, and therefore influences the real opportunities women can access in everyday urban life [6–12]. This perspective is also consistent with the international policy agenda: UN Women's Safe Cities and Safe Public Spaces programme treats women's safety as a condition for the full use of public space and urban participation, while the wider Sustainable Development Goals (SDGs) framework links gender equality, inclusive cities, and freedom from violence in public and private spheres [13–17]. Recent literature further shows that women's perceived safety is shaped by the interaction of physical, social, individual, and temporal factors, and therefore cannot be treated as a neutral or isolated variable. Public space may be formally open to all, but not equally accessible in practice. Women's use of streets, parks, transit spaces, and other urban environments is often influenced by everyday risk management, prior experiences, care responsibilities, and unequal conditions of access. This also calls for an intersectional perspective, since safety perceptions vary according to age, socio-economic position, ethnicity, caregiving roles, and other overlapping dimensions. Women's fear can therefore be read as part of a broader condition of everyday urban inequality rather than as a simple fear-of-crime response [18–20]. This shift in perspective is important because fear does not only affect perception; it also reshapes behaviour and access. Women may avoid certain places or time slots, alter routes, rely on more costly or less efficient transport solutions, reduce their use of public space, or limit participation in work, education, leisure, and civic life. In this sense, gendered urban insecurity has socio-economic effects that can be expressed through longer travel times, higher mobility costs, reduced access to jobs and services, lower frequency of public-space use, and diminished urban autonomy. Here the key issue is not mobility per se, but accessibility and opportunity. The Organisation for Economic Co-operation and Development/International Transport Forum (OECD/ITF) explicitly define accessibility in terms of access to opportunities, goods, and services, while World Bank research shows that the accessibility, availability, and safety of public transport affect women's labour-market outcomes and broader economic participation [15, 16, 18, 19, 21, 22]. Such a perspective is especially relevant for urban planning. While the literature has become increasingly sophisticated in measuring women's perceived safety and its environmental correlates, much less attention has been devoted to the methodological question of how fear, constrained mobility, and restricted use of space can be translated into measurable socio-economic impacts and planning-oriented indicators [11, 23–25]. Existing studies remain fragmented across urban studies, transport research, geography, public health, criminology, and gender studies; as a result, methods are often either rich in subjective insight but weak in spatial comparability, or strong in spatial modelling but less able to capture the lived and unequal character of fear. This paper responds to that gap by presenting a structured review of the methodologies used to operationalize the socio-economic implications of gendered urban insecurity in urban contexts. It does not aim to represent the whole literature, but to reconstruct the methodological architecture of a targeted subsample in which women-centred studies and transferable methodological studies are analysed together. This contribution is conceived as a starting point for a broader and more complex research programme currently under development. For this reason, the wider body of literature will be further expanded, systematized, and discussed in a separate and more comprehensive review paper. The contribution of the paper is twofold. First, it offers a

structured methodological reading of a literature that is often discussed thematically but less frequently organized in terms of how it constructs measurable evidence. Second, it lays the groundwork for future research aimed at developing more integrated, gender-sensitive, and spatially explicit frameworks for urban planning. In this sense, the next challenge is not simply to document that women feel unsafe in cities, but to measure how that insecurity produces unequal access to opportunities, additional daily burdens, and socio-economic disadvantage in ways that planning can meaningfully address.

2 Review Method

As per the classical Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) criteria have been implemented as per PRISMA guidelines [26] that helps to systematically report literature reviews and critically synthetize and analyse the information highlighted. The present work will present a subsample of the total systematic review, focusing on the methodologies topic. The original research has been undertaken to explore how socio-economic impacts are measured in the view of woman perception and enjoyment of the city public space. The criteria of PRISMA utilize a comprehensive methodology to find, evaluate, filter and complete research literature in a very systematic manner. This approach has been widely used in areas like social and economic equity, digital inclusion and technology-driven societal change among others. The following actions have been implemented for the search strategy: *(i)* Determining the original body of literature; *(ii)* Implementing a strict screening procedure; *(iii)* Evaluating the effectiveness of particular studies; *(iv)* Finalizing the *corpus* for the examination. The research technique, inclusion and exclusion criteria, and data extraction procedure are thoroughly explained in the part that follows.

2.1 Search Strategy

A systematic search strategy was applied across Scopus as the main bibliographic database, complemented by Google Scholar and Mendeley as literature discovery tools, to ensure broad coverage of the literature on socio-economic impact indicators and women's fear in urban contexts. In particular, Google Scholar was used to identify relevant non-indexed works, given that parts of the social sciences and psychology—particularly in the Italian academic context—are not fully covered by bibliometric databases. The corpus was further refined through backward snowballing, by screening the reference lists of key review papers and highly relevant methodological contributions. The main search terms used were "women" AND "urban safety" AND "socio-economic impact"," "women's fear" AND "public space" AND "economic impact", "women geography AND social equity," "women AND economic AND equity," "women" AND "urban vulnerability" AND "economy", "women fear" AND "socio-economic impact", "gender-sensitive planning" AND "socio-economic impact" and similar term combinations. These terms were chosen to include studies that specifically focus on gender lens in urban planning, women unequal access to opportunities, fear barriers in pedestrian pathways in the cities and highlight the role of economy in widening or narrowing the social and economic equity, thereby addressing systemic biases in evaluation, planning

and assessment applications. The search was conducted in January 2026, with a restriction on publication date from 2020 to focus on the most contemporary research. The search queries were formulated using a combination of keywords and Boolean operators to ensure coverage of pertinent literature. Specific inclusion and exclusion criteria have been established to refine the corpus of studies (Fig. 1).

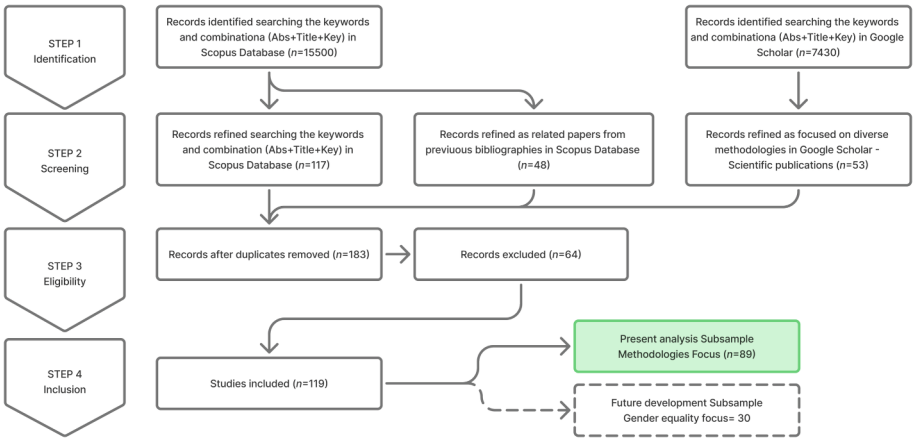

Fig. 1. PRISMA steps applied to the present research (Author elaboration)

2.2 Inclusion/Exclusion Criteria

The screening and selection process followed a two-step procedure. First, titles, abstracts, and keywords were examined against predetermined inclusion and exclusion criteria in order to remove records that were not relevant to the aims of the study. The review considered journal articles, conference papers, book chapters, and selected reports, while excluding posters, editorial commentary, opinion pieces, and non-peer-reviewed contributions. Priority was given to peer-reviewed and indexed publications, whether open access or accessible through the author's university subscriptions; however, non-indexed works were also considered when relevant, since the scientific corpus related to these social-science questions cannot be treated as purely bibliometric. To be included, studies had to focus on urban contexts, explicitly address women, women's safety, or gendered urban insecurity, and present a recognizable methodological component, such as measurement, operationalization, indicator design, modelling, accessibility assessment, burden analysis, or the use of socio-economic proxies. Studies were excluded if they were purely criminological, or if they focused mainly on labour-market or health issues without spatial relevance or planning significance. Only studies written in English or Italian and available in full text were considered. Records that passed the first screening stage were then subjected to full-text review in order to verify their thematic relevance, methodological rigor, and contribution to the methodological debate on gendered urban insecurity and socio-economic inequality in cities. Once the *corpus* was finalized, a structured coding procedure was used to extract the main analytical features of each study,

including research questions and objectives, the methodological and analytical techniques employed, and the main findings regarding the relationship between women's urban insecurity, access, mobility, and broader issues of social and economic justice, as well as the implications for more equitable planning and assessment frameworks. Finally, a narrative synthesis was adopted to integrate findings across the selected studies and provide an overall account of the main methodological trends, recurring themes, and research gaps in the field.

2.3 Coding Protocol

A structured coding protocol was developed to classify each study included in the formalized database according to its methodological and planning relevance. The classification into CORE, METHOD_SUPPORT, and CONTEXT was defined in relation to the specific focus of this proceedings. CORE papers are those directly addressing gender-sensitive urban accessibility through spatial or data-driven methodological approaches and linking indicator construction to the socio-economic impacts of inequality. METHOD_SUPPORT papers are studies that provide transferable methodological tools for analysing these issues, even when they do not fully address the same substantive focus. CONTEXT papers include contributions on broader gender-equality policies and strategies in urban settings, which provide conceptual and policy background but are not central to the methodological architecture of this review. In order to preserve comparability across the *corpus*, each paper was coded along the following analytical dimensions: urban domain (street, park, transit, neighborhood, public space, or mixed urban environment), core phenomenon (fear, perceived safety, insecurity, avoidance, mobility constraint, or restricted use of space), socio-economic dimension (access to jobs, access to services, time burden, transport cost burden, participation, stay behavior, wellbeing, or labor outcomes), data source (survey, interview, safety audit, participatory mapping, app/crowdsourcing, GIS/open data, street-view imagery, or administrative/transport data), method family (descriptive statistics, factor analysis, GIS overlay, accessibility indicators, composite index, OLS, GWR, SEM, ML, or mixed methods), output (score, map, index, model, typology, or dashboard), planning use (diagnosis, prioritization, design support, accessibility appraisal, or policy evaluation), spatial scale (point, street segment, neighborhood, or city), and validation strategy (none, model fit, sensitivity, spatial validation, expert validation, or triangulation). Because the *corpus* also includes review papers, reports, and methodological essays, an auxiliary study-design field was added and, where strictly necessary, review-based values such as review/document *corpus* and review synthesis were used to avoid forcing non-empirical studies into purely empirical categories.

3 Results: Taxonomy of Methodologies

In order to incorporate findings from several studies and provide an initial but complete overview of themes, trends, and research gaps in the filed a narrative syntesis was used. The total *corpus* includes 119 records and provides a methodologically useful snapshot of the recent literature at the intersection of women's perceived safety, urban space,

accessibility, and socio-economic implications. The corpus is strongly contemporary: the temporal distribution of the full database clearly highlights the growing relevance of the topic over time. After a sporadic presence in the earlier years (2008–2020), the number of publications increases markedly from 2021 onward, with a particularly sharp rise in 2023–2025 and a peak of 33 records in 2025 alone. In document-type terms, journal articles dominate, followed by review papers and a smaller but important group of conference papers and reports. This distribution suggests that the field is rapidly expanding and remains strongly method-driven, with methodological innovation often outpacing conceptual consolidation. To spatially locate the literature, the analysis considered the geographical location of the case studies rather than the institutional affiliations of the authors. Two main clusters emerge: one centred on China (14 papers) and another including studies of global or international scope (15 papers), the latter reflecting the strong presence of review and theoretical contributions based on multiple case studies. Beyond these two clusters, the most represented countries are India, Italy, and Iran. A notable feature is the hybrid composition of the *corpus*. The database does not consist only of studies directly centred on women's fear or gendered urban insecurity and six overlapping methodological-lexical groupings emerge. These should not be interpreted as mutually exclusive thematic clusters, since the same study may belong to more than one grouping (Table 1).

Table 1. Tematic clustering of corpus of literature – 119 records (Author elaboration)

Grouping	N
Papers using a lexicon related to planning/policy/decision-making	50
Papers placing women/gender/gender differences/gender inequality at the centre of the analysis	49
Papers explicitly referring to machine learning/deep learning/computer vision/GeoAI	36
Papers revolving around street-view imagery/visual perception/image-based analysis	34
Papers including survey/questionnaire/intercept survey/participants/crowdsourcing	26
Papers using or explicitly referring to GWR, MGWR, GIS, spatial statistics, kernel methods, or spatial modelling	14

For the purposes of this paper, the analysis focuses on a methodological subsample composed of CORE and METHOD_SUPPORT studies only. This makes it possible to reconstruct the methodological architecture of the field while distinguishing between studies directly centred on women's urban insecurity and studies that provide transferable methods from adjacent domains. Within this subsample, CORE papers represent the analytically central inner core, while METHOD_SUPPORT papers are used to frame the broader methodological repertoire adopted or adapted in the field (Total 89 paper). The VOSviewer term map based on titles, author keywords, index keywords, and abstracts in the final methodological subsample of 89 papers confirms that the dominant vocabulary of the corpus is still centred on visual urban perception, computational methods, and built-environment analysis (Fig. 2).

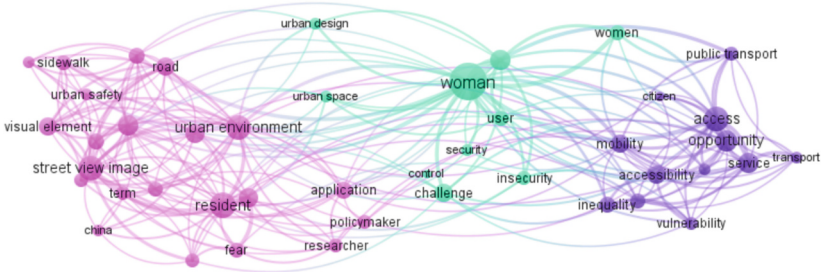

Fig. 2. Dominant lexical markers in the final *corpus* of 89 papers (author's elaboration with VOSviewer software)

The map includes 44 items organized into 3 clusters, showing the strong interconnection between terms related to women and gender, urban environment and visual perception, and access, mobility, and opportunity. Terms such as street-view or image-based visual analysis (31 papers), machine learning (20), deep learning (16), and semantic segmentation (10) occur frequently, while built environment appears in 18 papers. At the same time, the subsample shows a substantial gender-sensitive component, with 34 papers explicitly referring to gender, women, or female perspectives, and a relevant planning-oriented dimension, with 29 papers using a planning or urban-planning lexicon. By contrast, the socio-economic vocabulary remains less consolidated than the perception-oriented and computational one. These frequencies should be interpreted as overlapping lexical markers rather than as exclusive thematic categories, since the same paper may contribute to more than one strand. While the coding protocol (§ 2.3) was applied to the whole *corpus,* but Table 2 reports only the results of the CORE subset coding, which allows a partial but still meaningful interpretive reading of the literature.

Table 2. CORE (12 records) *corpus* coded (Author's elaboration).

ID	urban domain	core phenomenon	socio-economic dimension	data source	output	planning use	spatial scale
[27]	street; transit	perceived safety; mobility constraint	access to services	survey; street-view imagery	score; index	accessibility appraisal; design support	street segment; neighborhood
[28]	transit; street	insecurity; perceived safety; mobility constraint	access to services	survey; street-view imagery	score; model	diagnosis; design support; accessibility appraisal	point; street segment
[12]	street; mixed urban environment	perceived safety; insecurity	wellbeing	street-view imagery; GIS/open data; survey	model; map; score	diagnosis; policy evaluation	street segment; city
[29]	street; public space; mixed urban environment	perceived safety; insecurity; mobility constraint	participation	app/crowdsourcing; GIS/open data; safety audit	index; map; dashboard	prioritization; policy evaluation; design support	point; street segment; city

(*continued*)

Table 2. (*continued*)

ID	urban domain	core phenomenon	socio-economic dimension	data source	output	planning use	spatial scale
[30]	mixed urban environment; transit	mobility constraint	access to jobs; access to services	review/document corpus	typology; model	accessibility appraisal; diagnosis	city
[31]	transit; mixed urban environment	mobility constraint; perceived safety	access to jobs; access to services; time burden; transport cost burden; labor outcomes	review/document corpus	typology; index; model	policy evaluation; accessibility appraisal; prioritization	city
[32]	transit	mobility constraint; perceived safety; insecurity	access to services; participation	review/document corpus	typology	policy evaluation; accessibility appraisal	city
[33]	transit	insecurity; mobility constraint	access to jobs; participation; labor outcomes	survey; interview; administrative/transport data	typology; model	policy evaluation; prioritization	city
[34]	mixed urban environment; transit	mobility constraint	access to jobs; access to services; participation	survey; interview	index; model	accessibility appraisal; policy evaluation	city; neighborhood
[35]	public space; transit; mixed urban environment	insecurity; mobility constraint	participation	review/document corpus; GIS/open data	typology; map	policy evaluation; design support	city
[18]	transit; mixed urban environment	mobility constraint; perceived safety	access to jobs; access to services; time burden; transport cost burden; labor outcomes; participation	survey; interview; administrative/transport data; safety audit	model; typology	accessibility appraisal; policy evaluation	city
[36]	transit; mixed urban environment	mobility constraint	access to jobs; access to services; time burden; transport cost burden; participation; labor outcomes	review/document corpus	index; model; typology	accessibility appraisal; policy evaluation; prioritization	city

The coding of the CORE corpus highlights a coherent methodological landscape, in which women's fear, perceived safety, and gendered urban insecurity are clearly positioned at the centre of the analysis. Within this subset, the literature remains strongly oriented toward the measurement of perceived safety through surveys, spatial analysis, and, increasingly, computational and image-based methods; however, approaches explicitly translating these phenomena into socio-economic impacts, accessibility constraints, and planning-ready indicators are still comparatively less developed. Overall,

the literature is dominated by approaches that attempt to operationalize perceived safety through measurable proxies.

3.1 Methodologies - Overview

Given the methodological focus of this paper, the analysis of the methodological subsample (89 records) identifies five main methodological families. As reported in Table 3, these families are not mutually exclusive, but partially overlapping, since several papers contribute to more than one methodological strand.

Table 3. Five main methodological families in the 89-paper methodological subsample (author's elaboration)

Methodological families	Main focus	Typical methods
1. Methodologies for operationalizing fear and perceived insecurity in urban spaces	Measuring fear, perceived safety, insecurity, and their visual-spatial correlates	Likert scales, fear questionnaires, perception scores, structured interviews, psychometric approaches, pairwise comparisons, image-based prediction, GeoAI
2. Methodologies for capturing avoidance, constrained mobility, and restricted use of space	Understanding how insecurity reshapes route choice, mobility timing, park/public-space use, and everyday behaviour	Path-choice studies, avoidance behaviour, nighttime mobility restrictions, walkability/stay behaviour, route deviation, behavioural proxies, mixed methods
3. Methodologies for measuring accessibility to socio-economic opportunities	Assessing unequal access to jobs, services, amenities, and everyday opportunities	Location-based accessibility indicators, cumulative opportunity measures, potential accessibility, transport accessibility frameworks, opportunity-based metrics
4. Methodologies for measuring time, cost, and mobility burden	Capturing the burdens produced by insecurity in terms of time, money, dependency, and mode choice	Travel time burden, additional travel cost, mode substitution, escorted mobility/dependency, affordability analysis, temporal penalties linked to avoidance
5. Methodologies for linking urban insecurity to socio-economic participation	Connecting insecurity to participation, labour outcomes, service access, wellbeing, and unequal urban opportunity	Labour-market outcomes, access to education/services, reduced public-space use, social participation, wellbeing proxies, composite or integrated indicators

Within the 89-paper methodological subsample, the most visible and consolidated family is computational and hybrid perception modelling, but the overall coding also shows a broader umbrella methodological architecture built around street-view imagery, computational and visual methods, deep learning, computer vision, GeoAI, semantic segmentation, surveys, GIS/spatial statistics, and mixed methods. This confirms that the field is not organized around a single technique, but around a hybrid methodological ecosystem in which visual-computational approaches are increasingly central. In particular, computational perception modelling includes street-view imagery, computer vision, deep learning, semantic segmentation, GeoAI, multimodal modelling, and image-based prediction used to infer perceived safety or fear of crime from the visual built environment. It is represented by studies such as Kim et al. [37], Kang et al. [38], Zhang et al. [39], Zhu et al. [12], and Zhang et al. [40], and reflects the broader trend highlighted by Dubey et al. [15], who emphasize the growing role of emerging technologies in the assessment of women's perceived safety. At the same time, the umbrella coding shows that computational approaches do not exhaust the field. A second major family is represented by survey, interview, participatory, and behaviour-oriented methods, including structured questionnaires, intercept surveys, interviews, thematic analysis, randomized image-based experiments, and crowdsourced perception data. A third important family consists of spatial-statistical and mixed-method approaches, which connect subjective perceptions to spatial evidence through GIS, GWR/MGWR, composite indices, and integrated visual-spatial frameworks, as in Gargiulo et al. (2020). Finally, the subsample also includes a smaller but strategically significant group of studies oriented toward accessibility indicators, transport equity, and burden analysis, particularly in work such as Rahmah et al. [41], Bhandari et al. [31], Oviedo et al. [42], and Dumedah et al. [43]. Overall, the subsample is methodologically strongest in modelling perceived safety and its visual-spatial correlates, while approaches more directly concerned with access, burden, and socio-economic participation remain comparatively less consolidated.

3.2 Methodologies for Operationalizing Fear and Perceived Insecurity in Urban Spaces.

The strongest strand in the 89-paper subsample concerns the operationalization of fear, perceived safety, and insecurity in urban environments. Here the literature is methodologically rich and highly heterogeneous. On the more traditional side, studies rely on Likert scales, fear questionnaires, psychometric inventories, structured interviews, and perception scores, as in Valera Pertegas and Guàrdia Olmos [44] and Navarrete-Hernandez et al. [45]. On the more recent side, these instruments are increasingly complemented or replaced by pairwise image comparisons, street-view-based perception models, GeoAI pipelines, multimodal large language models, and explainable computer-vision systems, as in Kim et al. [37], Kang et al. [38], and Zhang et al. [39]. The result is a rapidly expanding repertoire of ways to make perceived insecurity measurable and spatially explicit. However, this richness is accompanied by fragmentation. Dubey et al. [15] explicitly note that women's perceived safety is measured through diverse data types and formats and that lack of standardisation remains a persistent problem; te Braak and van Tienoven [16] similarly show that the literature varies widely across settings, scales, and methods. For this reason, the field is strong in capturing lived and perceived insecurity, but still

weaker in producing standardized and comparable metrics that can be directly mobilized in planning-oriented evaluation.

3.3 Methodologies for Capturing Avoidance, Constrained Mobility, and Restricted Use of Space

A second, smaller but conceptually decisive strand examines how insecurity reshapes women's actual urban behaviour. In the 89-paper subsample, this includes studies on path choice, walking routes, avoidance behaviour, nighttime restrictions, constrained mobility, park use, and reduced stay behaviour. Methodologically, this strand is built through route-based evaluations, self-reported mobility adjustments, behavioural proxies, surveys on transport or park use, and mixed-method designs. Good examples include Cui et al. [27] on women-oriented evaluation of walking routes to mass transit, Panahi et al. [46] on women's walking behaviour, Kaştaş-Uzun and Şenol [47] on women's park use, Raina and Mandal [48] on women's experiences in urban parks, and Saigal et al. [49] on the role of safety in declining public-transport use. This strand is analytically crucial because it makes visible the transition from perceived insecurity to restricted urban practice: fear does not remain an attitude, but becomes altered route choice, selective use of public space, temporal withdrawal, or modified travel behaviour. Reviews by Dubey et al. [15] and te Braak and van Tienoven [16] both underline that women's safety concerns reduce the use of public space, limit outdoor activity, and affect everyday mobility. Yet methodologically the strand remains less consolidated than perception modelling. In many studies, behavioural consequences are identified descriptively or through isolated variables, but are not yet converted into standardized indicators of burden, constrained access, or loss of autonomy.

3.4 Methodologies for Measuring Accessibility to Socio-Economic Opportunities

A further strand in the subsample addresses accessibility to jobs, services, amenities, and other urban opportunities. This family is especially important because it introduces a shift from mobility-centred to opportunity-centred thinking. Rather than asking only where women feel unsafe, it enables the question of which opportunities become less reachable because of insecurity, time constraints, mode limitations, and unequal transport systems. In methodological terms, the subsample includes location-based accessibility indicators, cumulative opportunity measures, potential or gravity-based accessibility, transport accessibility frameworks, and capability-based approaches. Rahmah et al. [30] are particularly important here, because their systematic review shows that only a small subset of accessibility studies explicitly focuses on women, and that most of those studies rely on catchment-based methods. Menon [34] extends this discussion by proposing a capability-based framework for women's mobility inequity, while Noor and Iamtrakul [32] connect women's access to public transport with institutional and policy constraints. More broadly, accessibility and equity-oriented reviews such as Dumedah et al. [43], alongside transport-indicator work such as OECD/ITF [19, 22], provide a methodological repertoire—cumulative, gravity-based, activity-based, and constraint-based measures—that is directly relevant for this agenda. The limitation, however, is that these tools are still only partially integrated with the women's safety literature. The

methodological building blocks exist, but the bridge between perceived insecurity and unequal access to socio-economic opportunities is still underdeveloped.

3.5 Methodologies for Measuring Time, Cost, and Mobility Burden

Among the 89 papers, the least developed but most policy-relevant family concerns the measurement of time, cost, and mobility burden. This strand focuses on how insecurity generates additional travel time, safer but more expensive modal choices, greater dependence on accompaniment, affordability problems, and temporal penalties linked to route or activity avoidance. The relevant methods are drawn mainly from transport equity, affordability, and gender-equity measurement rather than from women's safety studies in a narrow sense. Bhandari et al. [31] explicitly identify access, travel behaviour, public transit, mode choice, safety, cost, and time as key dimensions for measuring gender equity in transportation. Oviedo et al. [42] show that affordability and accessibility are closely linked and review how transport affordability has evolved into a framework for understanding barriers to access, forgone trips, and transport-related social exclusion. Dumedah et al. [43] likewise frame equitable transport access in terms of affordability, reliability, safety, and participation in valued activities, while Noor and Iamtrakul [32] and Araya et al. [50] bring these issues closer to women's lived experiences in public transport. Even so, the strand remains thin in operational terms. Only a small subset of the subsample actually formalizes indicators such as extra travel time, additional transport expenditure, escorted mobility dependence, or explicit temporal penalties. In most cases, burden is acknowledged conceptually, but not translated into standardized and comparable metrics.

3.6 The Big Gap: Methodologies for Linking Urban Insecurity to Socio-Economic Participation

The least consolidated and most innovative area of the 89-paper subsample concerns the link between insecurity and socio-economic participation. This is the point at which the literature moves beyond measuring fear, unsafe environments, or constrained mobility, and begins to ask how insecurity affects participation in work, education, services, leisure, and broader urban life. In the subsample, this strand appears through labor-market and employment outcomes, access to services and education, reduced public-space use, wellbeing proxies, transport participation, and early attempts at composite or integrated indicators. Araya et al. [50] explicitly connect personal safety in public transport to women's participation and employment; Alam and Bagnoli [51] discuss the role of public transport in women's economic empowerment; Kurshitashvili et al. [36, 52] move toward a mobility and gender index; and several reviews show that reduced safety and constrained access have consequences for wellbeing, participation, and urban opportunity [15, 30, 43]. Yet this strand remains methodologically uneven. Existing studies are much stronger in measuring insecurity than in quantifying what insecurity costs in terms of access, participation, burden, and unequal opportunity. In the current subsample, the socio-economic dimension appears as an emerging horizon rather than a fully stabilized methodological field. This is precisely the main gap identified by the proceedings: the

next step is not only to map unsafe places more accurately, but to build robust indicators that show how fear redistributes urban opportunities in unequal ways.

4 Discussion

The 89-paper methodological subsample shows a clear imbalance. The literature is now methodologically strong in measuring women's fear, perceived insecurity, and their visual, spatial, and environmental correlates, through surveys, interviews, GIS-based mapping, street-view imagery, GeoAI, and multimodal models [15, 16, 37, 38, 53, 54]. By contrast, far fewer studies translate these conditions into indicators of accessibility, burden, opportunity, or participation. Even when insecurity is linked to avoidance, constrained mobility, or reduced use of public space, these effects are rarely operationalized in standardized and planning-ready terms. In this sense, the literature remains stronger in diagnosing women's fear than in measuring its socio-economic implications. In this paper, socio-economic impact is understood not in terms of aggregate economic performance, but as the effect of gendered urban insecurity on access, burden, and unequal opportunity. The most relevant impacts therefore include reduced accessibility to jobs and services, additional travel time and costs, dependence on safer but less efficient mobility options, reduced use of public space, and lower participation in work, education, leisure, and civic life [30, 31, 33, 42]. The review shows that the literature is beginning to identify these effects, but is still weak in converting them into robust indicator systems. The main methodological gap is therefore not the measurement of fear itself, but the limited ability to show how fear produces measurable inequalities in access to urban opportunities.

5 Conclusions

This paper has examined the methodological landscape through which women's fear, perceived insecurity, and gendered urban inequality are currently studied in urban contexts. The review shows that the literature has made substantial progress in the measurement of women's perceived insecurity and in the modelling of its visual-spatial correlates. Within the methodological corpus, methods for capturing fear and perceived safety are now highly developed and increasingly hybrid, combining surveys, interviews, spatial analysis, street-view imagery, computational perception modelling, and other data-driven approaches. This confirms that the field is no longer limited to conventional fear-of-crime questions, but has evolved into a more complex methodological domain capable of integrating built-environment, social, individual, and visual dimensions.

At the same time, the review highlights a clear imbalance in the current state of the literature. Existing studies are considerably stronger in measuring perceived insecurity than in quantifying what insecurity costs in terms of access, participation, burden, and unequal urban opportunity. A first important strand captures the transition from perceived insecurity to restricted urban practice, showing how fear reshapes route choice, avoidance behaviour, use of public space, nighttime mobility, and everyday patterns of movement. A second and equally important strand begins to shift the analytical

focus from unsafe places to unequal access, asking which socio-economic opportunities become less reachable because of fear, constrained mobility, and gendered urban conditions. A third, smaller and still weakly consolidated strand addresses the temporal, financial, and organizational burdens associated with insecurity, including travel time penalties, higher mobility costs, escorted dependence, and reduced autonomy. Together, these strands indicate that the key challenge is no longer simply documenting where women feel unsafe in cities, but measuring how gendered urban insecurity reshapes everyday access to opportunities across urban space.

From a methodological perspective, the review suggests that future gender-sensitive urban indicator systems should move beyond the measurement of fear alone and incorporate spatialized metrics of access, burden, participation, and unequal urban opportunity. This does not mean abandoning perception-based methods; on the contrary, it means connecting them more systematically with accessibility analysis, behavioural indicators, and socio-economic evaluation. In practical terms, such planning-ready indicators might include, for example, a Safe Access to Essential Services Index, measuring the proportion of key urban opportunities reachable under conditions perceived as safe. The most promising direction for future research lies precisely in building stronger bridges between these methodological traditions, so that fear can be understood not only as a subjective condition or a spatial pattern, but also as a mechanism that redistributes opportunities unequally across the city. A further development of this research could involve a more detailed differentiation by urban context—such as metropolitan areas, inner cities, and other urban settings—as well as a closer investigation of whether particular zones showing greater vulnerability to the phenomenon.

The main contribution of this proceedings is therefore methodological. Rather than offering a full theoretical literature review, it provides a structured reading of the methods currently used to operationalize women's perceived insecurity and its wider urban implications. In doing so, it identifies both the strengths of the field—particularly its recent visual, computational, and hybrid turn—and its main limitation, namely the still limited capacity to translate gendered urban insecurity into standardized, planning-ready indicators. The next methodological challenge is not simply to map where women feel unsafe, but to develop robust and transferable tools capable of measuring how insecurity produces additional daily burdens, constrained access, and socio-economic disadvantage in ways that urban planning can meaningfully address.

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